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## A New Family of African Gymnophiona<sup>1</sup>

EDWARD H. TAYLOR<sup>2</sup>

In a recent publication (Taylor, 1968), I presented a taxonomic revision of the order Gymnophiona, there recognizing three families. At the same time I suggested that there was a strong possibility that a fourth family should be recognized to include *Scolecormorphus*, an African genus comprising six known species. This opinion was based on preserved alcoholic material and in part on the literature dealing with the genus. However, at that time I had not personally examined a skull of a single species of the genus. The unusual anatomy of the skull had been studied by C. G. S. de Villiers (1938), who reported on some of the cranial features. In 1956, D. J. Brand made a second exhaustive study of the cranial anatomy of *Scolecormorphus uluguruensis* and compared it to skulls of other caecilian genera. Neither author was concerned primarily with taxonomy.

In my recent anatomical studies I have had available the skulls of two species of this genus—*Scolecormorphus vittatus* and *S. kirikii*. These have confirmed my belief that it is imperative to recognize the family Scolecormorphidae as a fourth family of the Gymnophiona, and it is here described.

### Family Scolecormorphidae fam. nov.

(Figs. 1-5)

The type genus of the Scolecormorphidae is *Scolecormorphus* Boulenger (1883), a genus with six recognized species, all African in distribution, being known in Kenya, Tanzania, Malawi, Zambia and the "Cameroons."

The general characteristics are: primaries, so far as known, 120-154; no secondary folds; a terminal unsegmented "shield"; no scales present; splenial teeth absent; eyes degenerate, under bone, without orbit (or drawn forward into tentacular open groove by tentacle); tentacle with an external sub-globular swelling, partly surrounded by a groove, through which the extrusible part of tentacle is extended; male penis bears numerous spines of variable

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<sup>2</sup> Research Associate, University of Kansas Museum of Natural History.

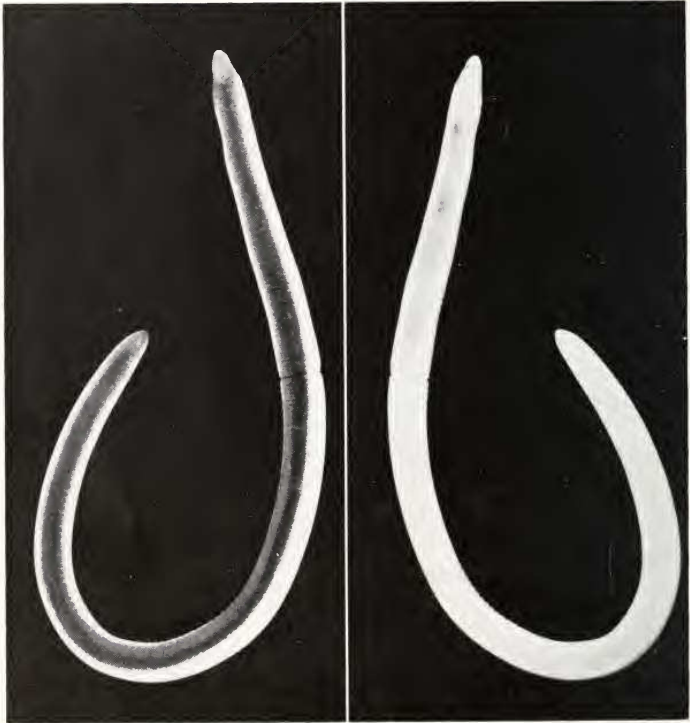


FIG. 1. *Scolecomorphus vittatus* Boulenger. National Mus. Nairobi, No. A-142. From Amani, East Usumbara Mountains, Kenya, Africa. Dorsal and ventral views. Actual length, 163 mm.

size which may or may not be arranged symmetrically; strong diastema present between prevomerine and palatine teeth, the latter being directed outward diagonally rather than posteriorly; no narial plugs on tongue; seemingly no group loss or group replacement of teeth.

The cranial characters readily visible in a prepared skull are: dorsal surface from front to back roofed, in order named, with paired elongate nasals, paired frontals lengthened on sides, and a pair of parietals which reach almost to foramen magnum. This foramen surrounded by posterior part of compound basisphenoid which is sutured behind the parietals.

Lateral to this median area and bordering the median roof are first the septomaxillae, partly bordering the nostrils, the maxillopalatine and the squa-

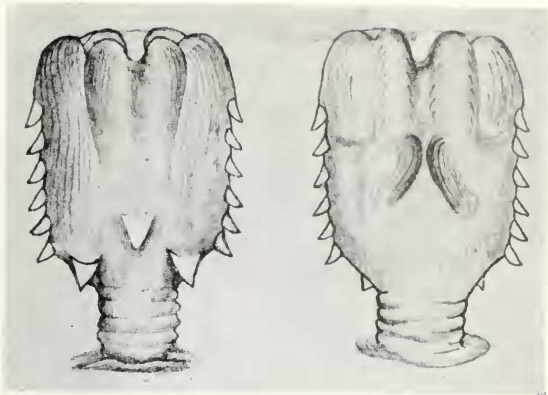


FIG. 2. *Scolecomorphus uluguruensis* Barbour and Loveridge (From Taylor, 1968, p. 655, fig. 361). Dorsal and ventral views of the extended penis showing spines. Much enlarged.

mosals, these latter bones widely separated from parietals and posterior part of frontals by extremely large diastemata that leave much of lateral surface of braincase visible from above. Palatine shelves and orbitosphenoids surround internal nares. Otic capsules somewhat inflated as seen from above. No eye socket present, the eye covered by bone (or in this case the eye pulled by the tentacle forward into open tentacular groove and lying beside edge of septomaxilla below nostril.

Tentacular aperture in skull begins near middle of maxillopalatine, widening anteriorly. It is visible from ventral surface of skull.

Snout extends some distance beyond premaxillary tooth row, this tooth series continuous with maxillary series, both much in advance of short prevomerine series. Palatine series on palatine shelf of maxillary separated from prevomerine teeth by wide diastema, the series directed diagonally outward and coming to lie directly behind maxillary series, yet not continuous with it. Prevomerine bones are narrowed, in contact with each other for more than four-fifths of their length, the portion anterior to prevomerine teeth longer than the part posterior to them. A wide diastema between basisphenoid (with the orbitosphenoid) and squamosal, thus exposing much of surface of orbitosphenoid as well as the posterior sides of the braincase.

Quadrates are sutured to posterior ends of squamosals. Stapes are completely absent (or perhaps completely incorporated into the compound bone here called the basisphenoid).

In one skull an area on maxillary superficially appears to be a prefrontal, but this solidly fused to maxillary. However, septomaxillae are definitely separate bones reaching below nostrils to contact small premaxillae.

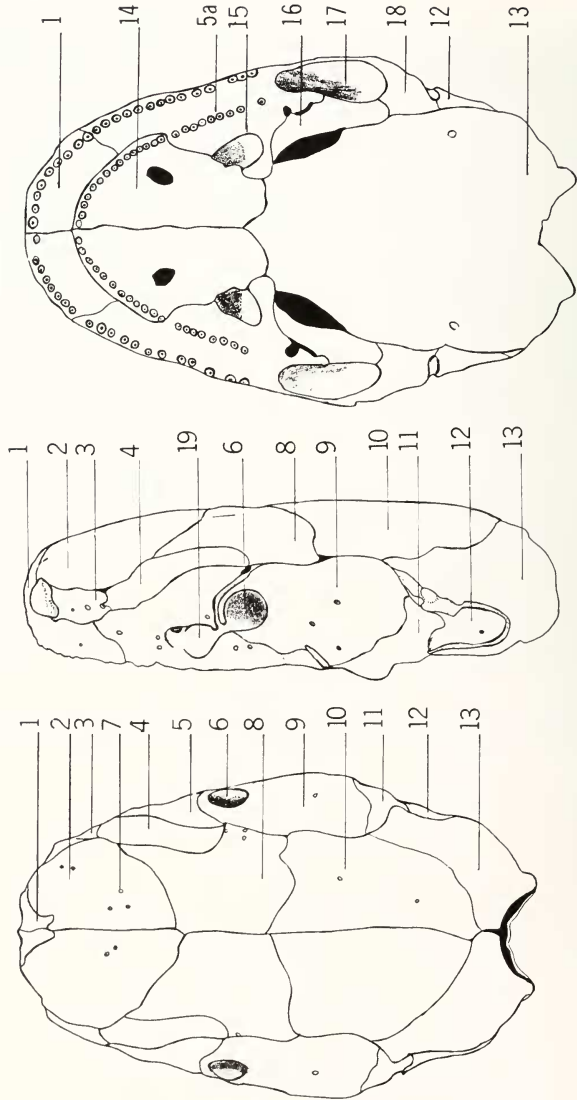


FIG. 3. Diagrams of a typical skull of *Gymnophiona*. Dorsal, lateral, and ventral views of the skull of *Caudacacilia ueberi* (Taylor). 1, premaxillary; 2, nasal; 3, septomaxilla; 4, prefrontal; 5, maxillary; 5a, palatine shelf of maxillary; 6, orbit of eye; 7, fenestra for nerves and blood-vessels; 8, frontal; 9, squamosal; 10, parietal; 11, quadrate; 12, stapes; 13, basisphenoid (compound); 14, preomer; 15, internal naris (choana); 16, pterygoid; 17, fenestra for jaw muscles; 18, quadrate; 19, tentacular groove.

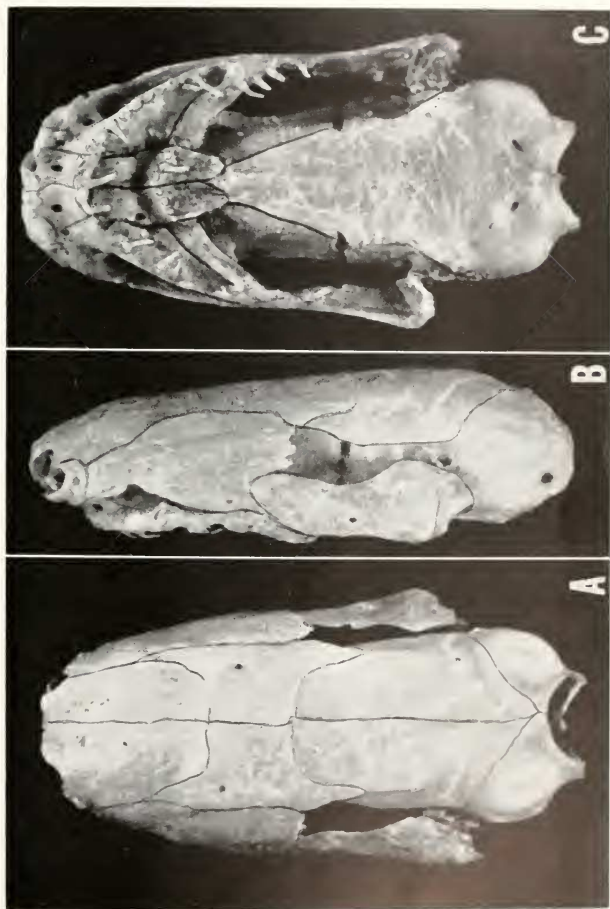


FIG. 4. *Scalcotomorphus kirikii* Boulenger. Museum of Comparative Zoology, Harvard College, No. 27120, Cholo Mountains, Cholo District, Nyasaland (Malawi), Africa. Dorsal, lateral and ventral views of the skull. Actual skull length, 7.9 mm; greatest width, 4.05 mm.

The bones of the skulls of the species in this genus seem extremely fragile and certain bones poorly attached. (For more minute details of the skull structure, consult the excellent papers of C. G. S. de Villiers (1938) and D. G. Brand (1956).)

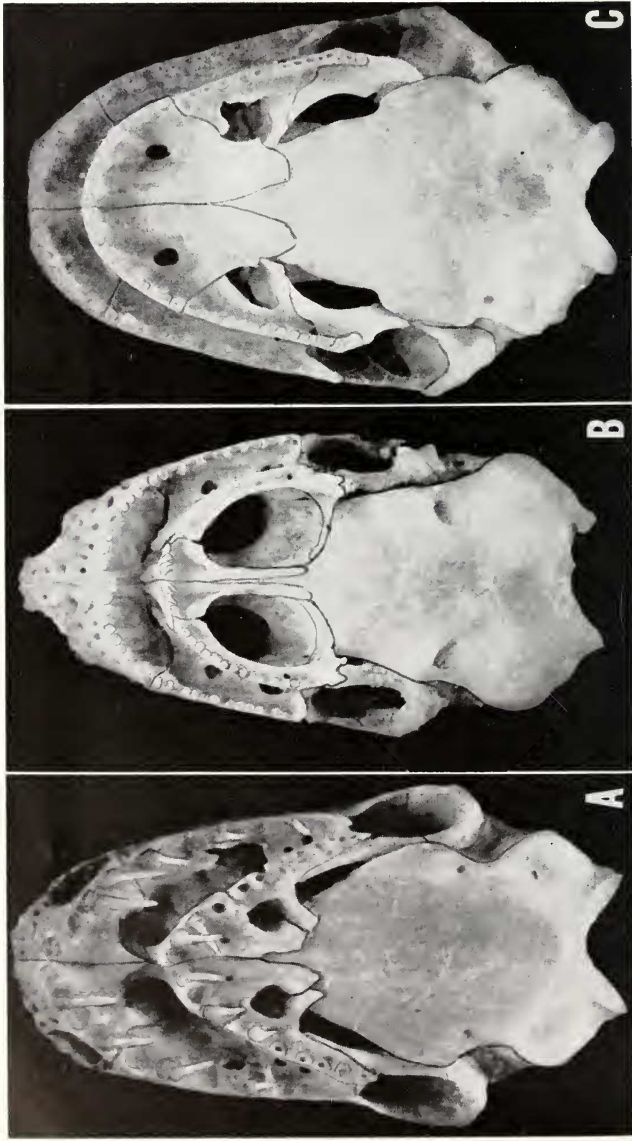


FIG. 5. Ventral views of three skulls. A. *Caecilia degenerata* Dunn. American Museum of Natural History, No. 23554. Actual length of skull, 10.1 mm; greatest width, 5.8 mm. Representative Caeciliidae. B. *Potamotyphlus kaupii* (Berthold). University of Illinois Museum of Natural History, No. 787. Actual length of skull, 10.9 mm; greatest width, 5.7 mm. Typhlonectidae. C. *Caudacacilia asplenica* Taylor. American Museum of Natural History, No. 23554. Actual skull length, 9.8 mm; greatest width, 6 mm. Ichthyophliidae.

As in all gymnophiones, the lower jaws articulate with the quadrate. Each side of the jaws is composed of two compound bones, the dentary, which bears the dentary teeth, and the articulare. Splenial teeth are not present.

For purposes of comparison, I include here a plate (Fig. 5) showing photographs of skulls representative of the three other recognized families—Caeciliidae, Typhlonectidae, and Ichthyophidae. While neither the skulls nor the photographs are perfect, anyone more or less familiar with the vertebrate skull may follow the comparisons given for this face of the skull.

Fig. 5A is a photograph of the skull of *Caecilia degenerata* which is fairly typical of the genus *Caecilia*, perhaps less so of the entire family of the Caeciliidae. In this skull the prefrontals, oculars and septomaxillae are absent as separate bones. The nasals and the premaxillae are fused to form the nasomaxillae. The frontals are completely separated by the mesethmoid (a character that is not universal in the Caeciliidae [in the sense here understood]).

Compare the *Scolecormorphus* skull with this as regards the position and arrangement of the prevomerine teeth and the shape and character of the prevomers themselves. Compare the broadly exposed expanse of the orbitosphenoid, observing its condition in *Caecilia*. Note the broad diastemata in the continuity of the prevomerine teeth and palatine teeth and the lack of diastemata in *Caecilia*.

Fig. 5B is a representative of the aquatic family, the Typhlonectidae. The skull is that of *Potamotyphlus kaupii* (Berthold). Observe that the internal nares are relatively enormous and that the diastemata between the prevomerine and the palatine teeth are small. There is no broad exposure of the orbitosphenoid since the fossa between the basisphenoid and pterygoid, and the maxillopalatine, is practically nonexistent. The dorsal conformation of the skull shows the absence of the prefrontals, the septomaxillae and the oculars, while the premaxillae and the nasals are fused to form the nasopremaxillae. Dorsally a broad diastema is present between the parietal and squamosal. The orbit of the eye is cut between the squamosal and the maxillopalatine. The tentacular aperture emerges from the anterior end of the maxillopalatine. The stapes is present, the nostril very large.

Fig. 5C is a representative of the Ichthyophidae. The prevomers are greatly widened. The dental series are subparallel. The pterygoids are flattened, not fused with the quadrate. The stapes is present, making contact with the quadrate. The skull on the dorsal and lateral surfaces has the separate premaxillae, nasals, prefrontals, septomaxillae, and oculars.

The genera of the Caeciliidae, as that family is now composed without the three other recognized families, seem to fall into two groups which differ very considerably and consistently. I consider these of subfamily rank and consequently propose two subfamilies, the Caeciliinae and the Dermophinae.

In the Caeciliinae I include the genera *Caecilia* Linnaeus and *Oscacaecilia* Taylor, the subfamily characters being the generic character of these two forms. The group is confined to South America.

In the Dermophinae I place the somewhat heterogeneous genera, as widely distributed as the order *Gymnophiona*, as follows: *Cryptopsophis* Boulenger, *Gymnopsis* Peters, *Dermophis* Peters, *Boulengerula* Tornier, *Gegeneophis* Peters, *Microcaecilia* Taylor, *Geotrypetes* Peters, *Grandisonia* Taylor, *Idiocranium* Parker, *Brasilotyphlus* Taylor, *Herpele* Peters, *Siphonops* Wagler, *Mimosiphonops* Taylor, *Praslinia* Boulenger, *Luetkenotyphlus* Taylor, *Parvicacilia* Taylor, *Afrocaecilia* Taylor, *Uraeotyphlus* Peters, *Pseudosiphonops* Taylor, *Copeotyphlinus* Taylor, *Schistometopum* Parker, *Indotyplus* Taylor, and *Hypogeophus* Peters. Whether the Dermophinae actually comprise all these genera cannot be determined with certainty until more is known of the anatomy and life histories of many of the genera.

#### KEY TO THE HIGHER GROUPS OF THE GYMNOPHIONA

1. Three pairs of *branched gills* arise laterally from pharynx with one or two functional gill slits, the gills usually absorbed before birth or hatching; gill slits function in those that are semiaquatic after hatching; organism may be semiaquatic during entire larval stage. Oviparous or ovoviviparous ..... 2  
 Larval gills arise from a dorsal point immediately following the occiput. These are *baglike, very close together* (may be connected at the base) *and are absorbed before birth*. Entirely aquatic, viviparous (ovoviviparous). External nares large, internal nares very large. Skull bones reduced in number, the premaxillae and nasals fused to make the two nasopremaxillae. Prefrontals, oculars, and septomaxillae absent. Stapes present, joining the quadrate; a large diastema between the parietal and squamosal. No scales; no secondary folds; no tail; eyes in sockets ..... Typhlonectidae
2. Septomaxillae, premaxillaries and nasals present as separate bones; stapes present or absent. Prefrontals and oculars present or absent ..... 4  
 Septomaxillae absent, the premaxillaries and nasals fused to form the nasopremaxillae; stapes present. Prefrontals and oculars absent ..... Caeciliidae 3
3. Premaxillary-maxillary teeth much enlarged, part of the series lost in groups and replaced in groups; part of prevomerine series and dentaries lost in groups and replaced in groups; eye in socket or bone covered; scales present or absent, secondaries present or absent; the number of vertebrae for the most part greater than in other genera. Life history practically unknown; scales present or absent. South and Central American ..... Caeciliinae  
 Premaxillary-maxillary, dentary, and prevomerine teeth presumably not lost or replaced in groups. (Eye in socket or bone covered?) Teeth not especially enlarged proportionally ..... Dermophinae
4. Prefrontal and ocular bones present, the latter may be partly fused to squamosal. Stapes present. Orbitosphenoid not widely exposed on ventral surface of skull. Primaries for the most part divided into three or four secondaries. A tail is retained; eye well developed in a socket; vent (except *Rhinotremu*) longitudinal. No distinct diastema between prevomers and palatine teeth. Tentacle closer to eye than nostril; scales invariably present.



The tadpoles passing through an aquatic stage of varying duration but eventually terrestrial. No spines on penis; splenial teeth usually numerous ..... Ichthyophidae  
 No prefrontal or ocular bones. Orbitosphenoid clearly visible from ventral surface of skull. A diastema between the prevomerine and the palatine teeth, the latter directed behind the end of the premaxillary-maxillary series. No stapes present. Spines on penis. No secondaries. No scales. No tail. Eye under bone (no socket). Tentacle close to nostril. Splenial teeth absent ..... Scolecomorphidae

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